Chemical Reactions and Enzymes Name: \_\_\_Key\_\_\_

Chemical Reaction is the process that changes one set of chemicals, also called the \_reactants\_, into another set of chemicals, which can be called the \_products\_.

It is often shown in the form below:

Enzyme

Reactants Products

Chemical reactions always involve the \_breaking\_ of bonds in the reactants and \_formation\_ of new bonds in the products.

2 Types of Reactions

1. Condensation (dehydration synthesis)

Dehydration synthesis (also called condensation reaction)

means….. You pull out water to produce one single molecule

from the original two molecules.

Molecule + Molecule 🡪 One Larger Molecule + Water

1. Hydrolysis

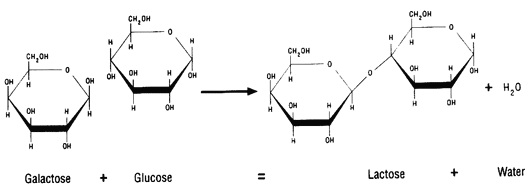
Hydrolysis means……. To use water to break one molecule into two smaller molecules.

One Larger Molecule + Water 🡪 Molecule + Molecule

Both of these types of reactions require or are associated with what molecule? \_Water\_

In each type of reaction you will see molecules of \_water\_, but it will be a reactant for one and a product for the other.

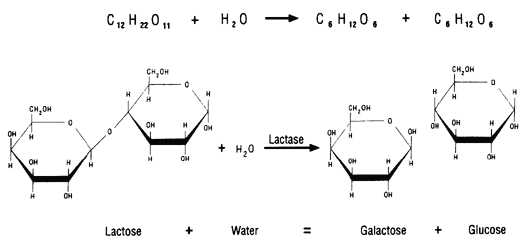
Let’s look at the reactions……



Which reaction do you think this is?\_Condensation or Dehydration Synthesis\_

Why? Water is pulled out of the two molecules to make a larger molecule

In this case two monosaccharides into one disaccharide.



What reaction do you think this is? \_Hydrolysis\_\_

Why?

Water is being used to break one larger molecule into two smaller molecules. Disaccharide into two monosaccharides.

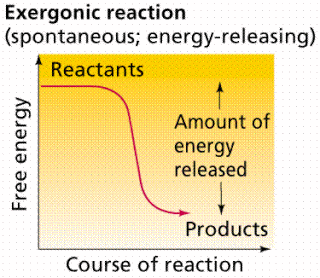
Endergonic vs. Exergonic Reactions

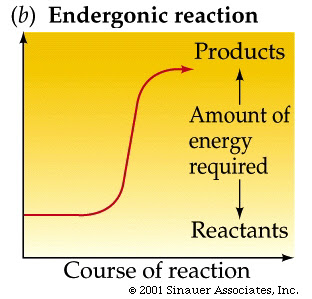
Some reactions are Other reactions are

\_Endergonic\_ \_Exergonic\_\_

which means that they which means that they

absorb energy. release energy.





Enzymes (A Special Type Of Protein)

Energy required to get a reaction started is called \_Activation\_ energy.

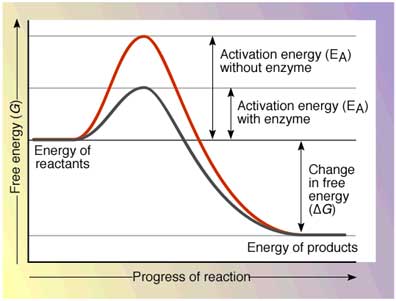
Important to Know:

Many of the reactions that are necessary for life to continue happen at a very slow rate.

In order to keep life going, and these reactions happening at the required rate your body using something called a \_catalyst\_.

\_Enzymes\_, such as lactase, are a type of catalyst. Enzymes commonly end in –ase (Ex Sucrase)

What is the purpose of an enzyme? To decrease the \_activation\_ energy required to get a reaction started.



The top of the “hill” is called the transition point, but the reaction does not actually happen until on the way back down. If you decrease the size of the “hill” you also decrease the energy required to begin the reaction.

How does an enzyme do its job?

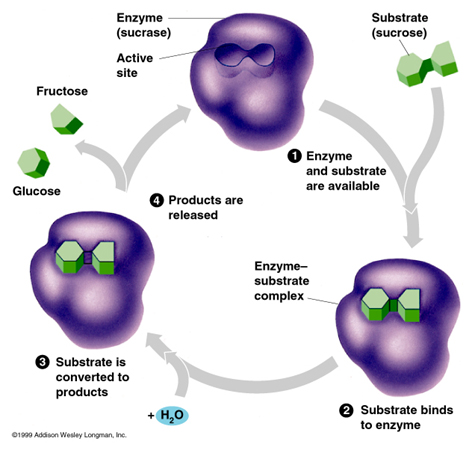
This is often called a lock and key fit or induced fit model. Each substrate must be able to “fit” into the enzyme active site. Because of this requirement enzymes are very specific for the substrate they work on.

Example: The enzyme lactase breaks down the disaccharide lactose.

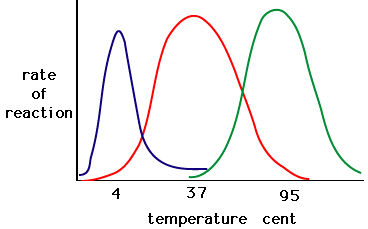
What example is shown in this diagram?

Sucrose, the sugar being broken down by the enzyme sucrase.

Enzyme-Substrate Complex



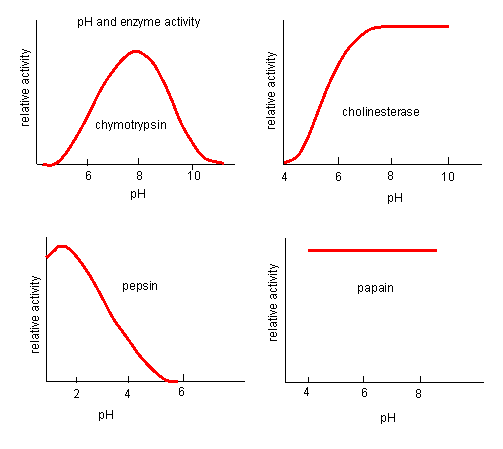
Factors that impact the rate the enzyme functions:

1) Temperature

There is an optimal

Temperature for all

Enzymes.



2) pH

Some enzymes work

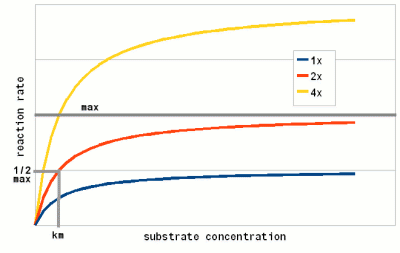
at a wide range of

pH’s and others will

only work at a

specific pH.

3) Substrate Concentration

Increasing the substrate

that the enzyme works

on will increase the rate of

the reaction up to a

particular point.

Chemical Reactions and Enzymes Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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It is often shown in the form below:

Enzyme

Reactants Products

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Dehydration synthesis (also called condensation reaction) means….. You pull out water to

produce \_\_\_\_\_\_ larger molecule from the original two molecules.

Molecule + Molecule 🡪 One Larger Molecule + Water

1. Hydrolysis

Hydrolysis means……. To use water to break one molecule into \_\_\_\_\_\_\_\_\_\_\_ smaller molecules.

One Larger Molecule + Water 🡪 Molecule + Molecule

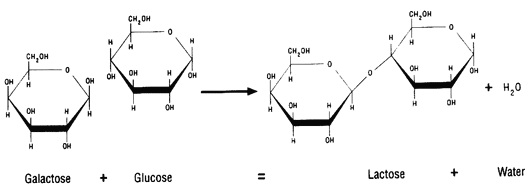
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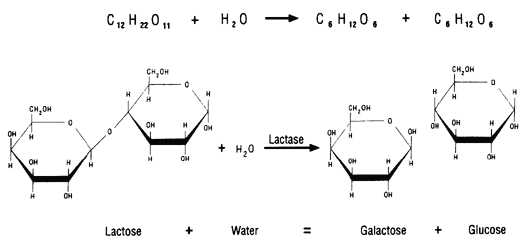
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Why?



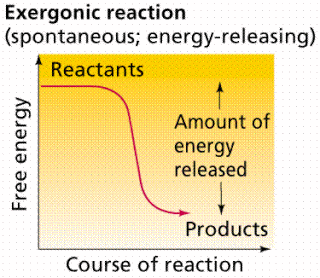
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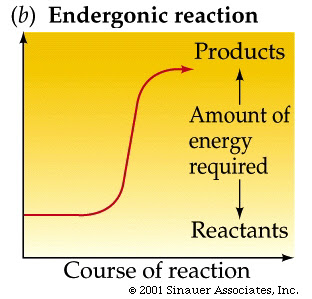
Why? 

Endergonic vs. Exergonic Reactions

Some reactions are \_\_\_\_\_\_\_\_\_\_\_\_ Other reactions are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

which means that they absorb energy. which means that they release energy.





Enzymes (A Special Type of Protein)

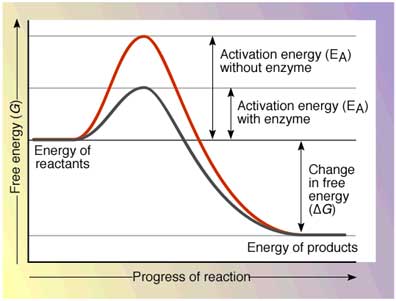
Energy required to get a reaction started is called \_\_\_\_\_\_\_\_\_ energy.

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In order to keep life going, and these reactions happening at the required rate your body using something called a \_\_\_\_\_\_\_\_\_\_\_.

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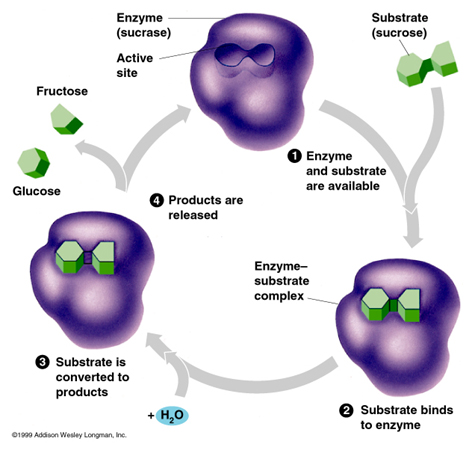
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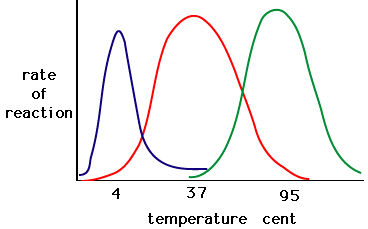
Example:

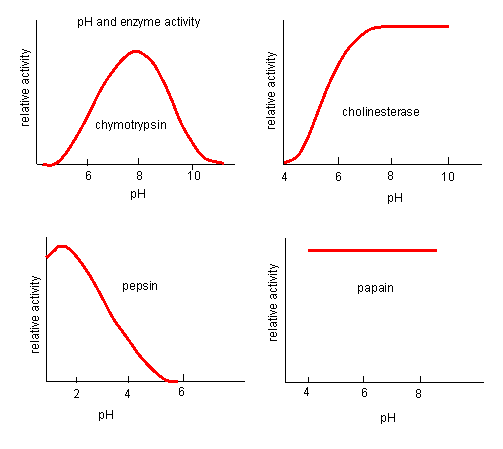
What example is shown in this diagram?

Enzyme-Substrate Complex



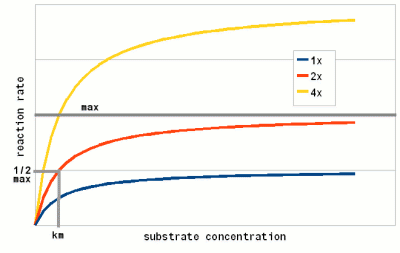
**Factors that impact the rate the enzyme functions:**

**1)**



**2)**

**3)**



**Notes Review Questions:**

1. What are the two types of reactions?

2. What is the difference between these two reactions?

3. What term is given to the materials going into a reaction (on the left side of the arrow)?

4. What term is given to the materials coming out of the reaction (on the right side of the arrow)?

5. When a reaction is energy releasing it is called?

6. When a reaction is energy absorbing it is called?

7. What is the purpose of an enzyme?

8. What type of macromolecule is an enzyme?

9. Looking at the enzyme-substrate complex diagram, write out the chemical equation for the reaction occurring in the diagram?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

10. What type of reaction was this (condensation or hydrolysis), how did you know?

11. What factors impact the rate at which an enzyme works?